

For the Candidate

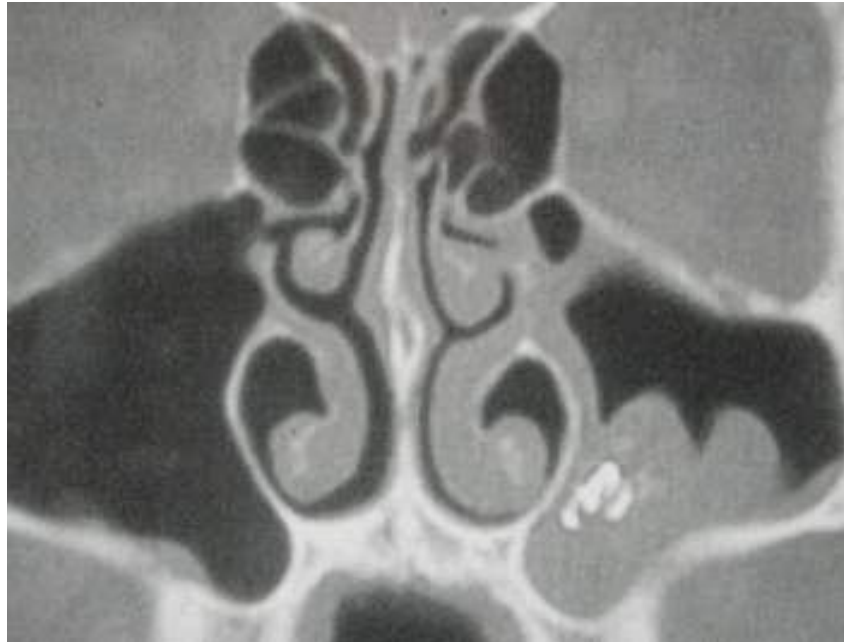
2d

Clinical Scenario:

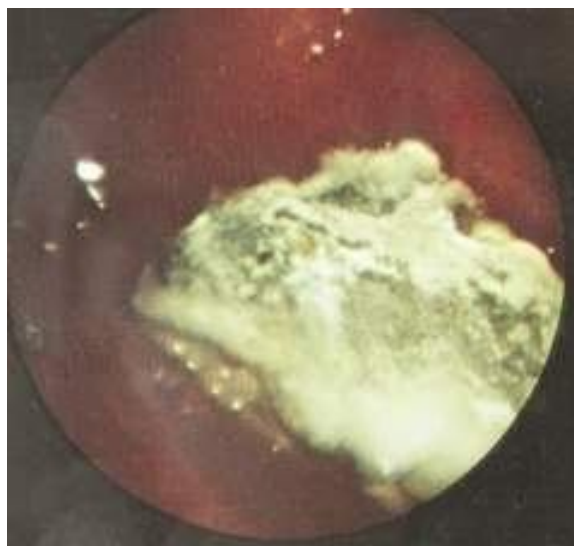
A 45 year old lady was referred by her dentist to the ENT-Specialist, because he found in the plain sinus x-rays some concretions in the left maxillary sinus. The lady had no problems or pains in the sinus region; sometimes she had some curious odours in der left nose. The dentist ordered for further evaluation a coronar CT-Scan. What do you see on the CT?



For the Candidate



The ENT-specialist made a sinuscopy and found this picture:



Question 1:

What do you see on these pictures and what is your first diagnosis ?
What is your next step?

2

For the Examiner

Blue Print:

Diagnosis, classification and treatment of fungal sinusitis

By Klaus Albegger

Question 1: 20%

What do you see on these pictures and what is your first diagnosis ?
What is your next step?

Question 2: 20%

What therapy would you recommend?

Question 3: 40%

What different forms of fungal sinusitis do you know?

Question 4: 20%

In which forms of fungal sinusitis a antifungal therapy (f.i. itraconazole, amphotericin B) additional to the endoscopic operation is necessary?

Background Information I

Fungal Sinusitis Classification

Fungal sinusitis may be categorized into four groups: fungus ball, allergic fungal rhinosinusitis (AFRS), acute invasive fungal rhinosinusitis, chronic granulomatous fungal rhinosinusitis.

Fungus ball

1. Isolated sinus involvement characterized by extramucosal fungal elements (mostly non-viable) and secondary debris is the hallmark of fungus ball. The maxillary sinus is the most common location; occasionally, the fungus ball can be found in the sphenoid sinus.
2. Symptoms include nasal obstruction, facial fullness/pain over the involved sinus (or at the cranial vertex in cases of sphenoid fungus ball).
3. The most commonly isolated fungus is *Aspergillus fumigatus*, although in most instances fungal cultures are negative. Purulent drainage occurs in the presence of bacterial superinfection.
4. The presence of fungal-specific IgE (by RAST or skin testing) is rare, and patients are immunocompetent.
5. CT scan demonstrates complete sinus opacification with occasional sinus expansion and bony remodeling. In most instances, areas of increased density are noted within the opacified sinus on CT scan.
6. Pathology demonstrates a dense mass of fungal hyphae without any evidence of fungal invasion; the mucosa shows chronic inflammation without granuloma formation and eosinophil predominance.
7. Treatment is surgical removal with mucosal preservation. With complete removal, recurrence is rare. Antibacterial treatment is for secondary bacterial infection. Anti-fungal treatment is not warranted.

Allergic Fungal Rhinosinusitis³⁹

1. Allergic fungal rhinosinusitis (AFRS) is characterized by thick eosinophilic debris (typically with fungal organisms), dense eosinophilic inflammation of the sinus mucosa, and polyposis. AFRS is typically unilateral, but in some cases it occurs bilaterally. Asthma is quite common in AFRS patients. AFRS patients are deemed immunocompetent.
2. CT scan shows complete opacification of contiguous sinuses; serpiginous areas of increased density (due to ferromagnetic elements in fungal debris) within this opacification gives a characteristic picture that is nearly diagnostic for AFRS. MRI findings typically include areas of hypointense signal surrounded by areas of mucosal inflammation; since eosinophilic fungal debris with low water content produces no MRI signal, sinuses in patients with advanced AFRS may show no MRI signal whatsoever.

Background Information II

AFRS can produce dramatic expansion of the paranasal sinuses with bony remodeling and orbital and skull base erosion; patient symptoms can be surprisingly mild even with extensive sinus expansion into the orbit and anterior cranial fossa.

1. Many patients demonstrate evidence of hypersensitivity (elevated total IgE or elevated specific antifungal IgE) and peripheral eosinophilia; originally, these findings were thought to represent a potential pathophysiologic mechanism, but true etiology of AFRS is still unknown.

2. Pathology confirms the presence of eosinophilic inflammation within the tissues and eosinophilic mucus (Charcot-Leyden crystals, or debris from eosinophil degranulation). Fungal invasion into the tissue is never present. Fungal elements may not be seen.

3. Dematiaceous fungi (*Bipolaris*, *Curvularia*, *Alternaria*, *Drechslera*, *Helminthosporium*, *Fusarium*, and *Exserohilum*) and *Aspergillus fumigatus* may be isolated from fungal cultures.

4. Treatment includes extensive endoscopic procedures for sinus marsupialization and removal of all fungal elements. Aggressive postoperative medical management, including systemic and topical steroids as well as culture-directed antibiotics for bacterial rhinosinusitis exacerbations is absolutely necessary. Some patients seem to do well with oral antifungals (itraconazole) and/or topical antifungals (itraconazole, amphotericin B). Some centers employ antifungal immunotherapy, but this approach is far from universally accepted. AFRS recurrence is quite common; long-term surveillance is warranted.

Acute Invasive Fungal Rhinosinusitis

1. Acute invasive fungal rhinosinusitis (also known as acute fulminant fungal rhinosinusitis and rhinocerebral mucormycosis) presents classically as sinusitis with a painless ulcer or eschar on the nasal septum or palate in an immunocompromised patient (acute leukemia, bone marrow suppression due to chemotherapy or uncontrolled diabetes).

1. The characteristic hallmark is fungal invasion into mucosa, bone, and adjacent soft tissues.

2. Onset is sudden and disease progression is rapid.

3. Etiologic organisms include fungus from the order Mucorales (*Rhizopus*, *Rhizomucor*, *Absidia*, *Mucor*, *Cunninghamella*, *Mortierella*, *Saksenaea*, *Apophysomyces*, and *Zygomycosis*) as well as *Aspergillus* species.

4. Pathology demonstrates hyphal invasion of the soft tissues (especially blood vessels), vasculitis and thrombosis, hemorrhage, tissue infarction, and a variable inflammatory infiltrate (which may be minimal due to systemic immunocompromise).

5. Treatment includes aggressive surgical debridement and systemic antifungals (intra-venous [IV] amphotericin B and caspofungin). If feasible, the underlying cause for immunocompromise must be reversed; appropriate treatment will fail if this cannot be achieved. Prognosis is poor with a survival rate as low as 30%.

Background Information III

Chronic Invasive Fungal Rhinosinusitis

1. Chronic invasive fungal rhinosinusitis is characterized by tissue invasion by fungal elements as well as a dense accumulation of fungal elements. The disease can be quite indolent and has a chronic course.
2. It has been associated with orbital apex syndrome (ocular immobility and decreased visual acuity due to a mass of fungal expansion into the superior orbit).
3. Pathology demonstrates tissue invasion by fungus and minimal inflammatory response
4. Treatment includes surgery (biopsy and debridement) and systemic antifungals (amphotericin B and caspofungin). Prognosis is poor

Chronic Granulomatous Fungal Rhinosinusitis

1. Chronic granulomatous fungal rhinosinusitis is characterized by fungal tissue invasion, which causes a granulomatous inflammatory response (giant cells, plasma cells). The causative organism is typically *Aspergillus flavus*.
2. Onset is gradual, and patients present with symptoms and findings caused by sinus expansion (ie, proptosis).
3. Surgery is required for diagnosis and debridement. Systemic antifungal treatment (IV amphotericin B) is absolutely necessary. The disease process heals with dense fibrous tissue that can spread to the brain, orbit, and facial soft tissues.